



**LT 1.C** – *I can describe and identify different sampling methods.*

3. You want to conduct a survey to determine the proportion of college freshmen likely to take more than one course in mathematics. Circle the sample that would be the most representative.

- a) A random sample of 100 U of M freshmen.
- b) A random sample of 100 college students.
- c) A random sample of 100 college freshmen.
- d) Ask the first 100 college freshmen you encounter.

4. Identify the most likely type of sampling that was used.

a) Police set up a sobriety checkpoint at which every fifth driver is stopped and interviewed.

Stratified                  Random                  Cluster                  Systematic                  Convenience

b) On days of presidential elections, the news media organize an exit poll in which specific polling stations are randomly selected and all voters are surveyed as they leave the premises of these stations.

Stratified                  Random                  Cluster                  Systematic                  Convenience

c) An engineering student measures the strength of fingers used to push buttons by testing family members.

Stratified                  Random                  Cluster                  Systematic                  Convenience

d) A marketing expert for MTV is planning a survey in which 500 people will be randomly selected from each age group of 10-19, 20-29, and so on.

Stratified                  Random                  Cluster                  Systematic                  Convenience

**LT 1.D** – *I can explain potential sources of bias in statistical studies.*

5. In a survey before a general election, a sample is drawn randomly from a list of registered Democrats to ask who they may vote for. Is there anything wrong with this sampling method? Explain.

**LT 1.E** – *I can use the language of observational studies and experiments to explain key issues and concepts.*

6. Could a placebo be used in an experiment testing the effectiveness of a drug? If so, why would it be important to use a placebo?

**LT 2.A** – *I can identify data as quantitative or qualitative, discrete or continuous, and by level of measurement.*

7. In a Harris Interactive poll of 2,303 adults, 26% said that they believe in astrology (the “science” including horoscopes).
- a) Is the number of respondents who believe in astrology from a discrete data set or a continuous data set?
- b) If we compile the ages of all respondents, is the data quantitative or qualitative?
- c) If we classify the respondents according to gender, what is the level of measurement? Explain.  
Nominal                      Ordinal                      Interval                      Ratio
- d) If we compile the ages of all respondents, what is the level of measurement? Explain.  
Nominal                      Ordinal                      Interval                      Ratio

**LT 2.B** – *I can explain and calculate different types of errors in measurements.*

8. A researcher measures the sitting height of a subject and records a value of 91.4 cm, but the subject’s actual sitting height is 89.0 cm.
- a) Find the absolute error. Show your calculations.
- b) Find the relative error. Show your calculations.

**LT 2.C** – *I can calculate percentages to report statistical change.*

9. In 1980 there were 121,601,000 registered passenger cars. There are now 143,781,202.

a) What is the absolute change? Show your calculations.

b) What is the relative change? Show your calculations.

**LT 2.D** – *I can calculate and explain index numbers to report statistical change.*

10. The average middle and high school teacher salary in 2010 was \$49,718. Assuming teacher salaries keep up with inflation, how much were middle and high school teachers paid (on average) in 1980? Show your calculations.

Average annual CPI (1982-1984 = 100)			
1975	53.8	1995	152.4
1980	82.4	2000	172.2
1985	107.6	2005	195.3
1990	130.7	2010	218.056

**LT 3.A** – *I can create and interpret frequency tables.*

11. The frequency table below shows the distribution of the weekly incomes of the employees of a law firm. Create a third column for the cumulative frequencies and a fourth column for the relative frequencies.

Incomes	Frequency
200–300	68
301–400	71
401–500	76
501–600	93
>600	10

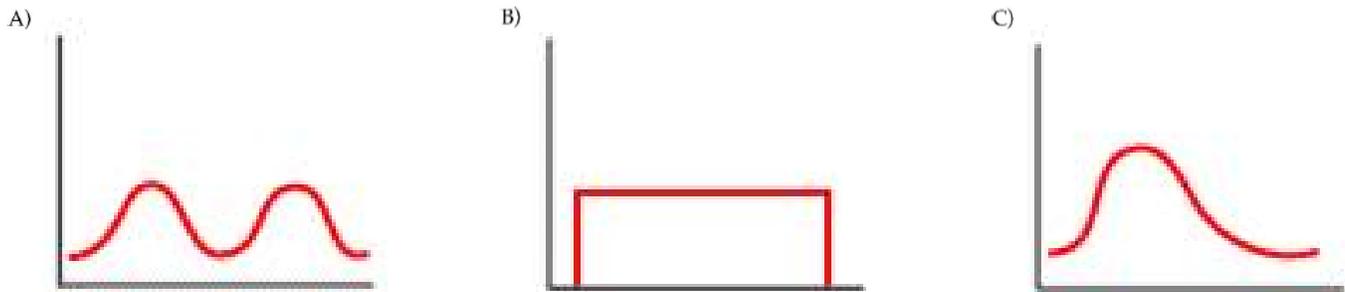
**LT 3.B** – *I can create and interpret graphs of qualitative data.*

12. Wagenlucht Ice Cream Company is always trying to create new flavors of ice cream. They are market testing three kinds to find out which one has the best chance of becoming popular. Of the taste testers, 15 preferred the Strawberry Cream, 30 preferred Choco-Nuts, and 5 preferred the Orange Mint. Construct a Pareto chart to represent these preferences.



**LT 4.B** – I can describe the shape of a distribution.

15. Describe the shape of each distribution by describing the number of modes as well as the skewness or symmetry of the distribution.



d) The weights of all the juniors at Washburn.

e) The ages of all staff and students at Washburn.

**LT 6.A** – I can calculate theoretical and relative frequency probabilities and identify subjective probabilities.

16. Identify each as a theoretical, relative frequency, or subjective probability. Explain.

a) The chance that you roll a sum of 7 with a pair of dice is  $1/6$ .

Theoretical                      Relative Frequency                      Subjective

b) The chance that my daughter Norah will go to college to become a mathematician is one.

Theoretical                      Relative Frequency                      Subjective

c) The chance that Kevin Garnett makes his next free throw is 79%, based on his career data.

Theoretical                      Relative Frequency                      Subjective

**LT 6.B** – *I can create and use a probability distribution to find probabilities.*

17. Consider the situation in which you flip a coin four times.

a) Construct the probability distribution with a table and histogram for the **number of tails**.

b) What is the probability of flipping at least two tails out of the four flips? Show your calculation.

**LT 6.D** – *I can calculate and explain expected values.*

18. On a 5–item multiple choice exam there are choices A-D on each item. A student who blindly guesses on each item may get anywhere from 0 to 5 correct. Let  $X$  = the number correct. The probability distribution of  $X$  is...

Value of X	0	1	2	3	4	5
Probability	.23730	.39551	.26367	.08789	.01465	.00098

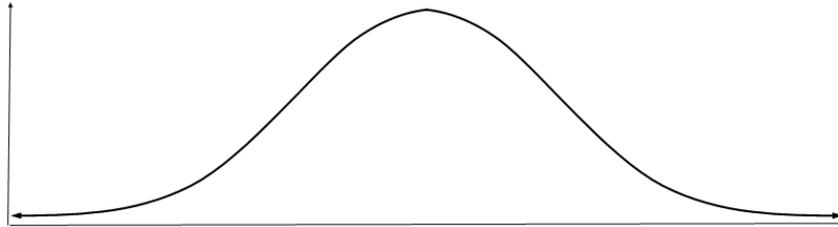
What is the student's expected value? Show your calculation and interpret the value in context.

**LT 5.A** – *I can find percentages and values using the 68-95-99.7 rule.*

**Don't use a z-score table to answer the questions on this page. Instead use the curve you construct below.**

**19.** The lifetimes of a type of battery is found to be approximately normally distributed. The average (mean) lifetime of the batteries is found to be 40 hours with a standard deviation of 2 hours.

- a) Label 3 standard deviations either way from the mean **and** include the percent of the distribution the area under the curve represents between the standard deviations?



- a) What percent of the batteries have a lifetime of between 36 and 42 hours?
- b) What percent of the batteries fail before 38 hours?
- c) 84% of the batteries have a lifetime less than how many hours?
- d) 2.5% of the light bulbs have a lifetime greater than how many hours?

**LT 5.B** – *I can find percentages and values using z-scores and the standard normal distribution.*

**Use a z-score table for this and any future question where you need one.**

**20.** The weights of boxes of macaroni have a distribution that's approximately normal with a mean weight of 32 ounces with a standard deviation of 1.3 ounces.

- a) About what percent of single boxes of macaroni will weigh more than 34.4 ounces?
- b) About what percent of single boxes of macaroni will weigh between 30 ounces and 31 ounces?
- a) What weight would put a box of macaroni at the 40<sup>th</sup> percentile?

**LT 5.C** – *I can find percentages and values using the Central Limit Theorem for the distribution of means.*

- 21.** The weights of boxes of macaroni have a distribution that's approximately normal with a mean weight of 32 ounces with a standard deviation of 1.3 ounces. What's the probability that the mean weight of a sample of 40 boxes of macaroni will weigh less than 31.7 ounces?

**LT 8.A** – *I can find a probability based on a sampling distribution of sample means or sample proportions.*

- 22.** The University of Minnesota has 51,147 students and 6700 of them are left-handed. What is the probability that a random sample of 80 students would result in a sample proportion of at least 17% who are left-handed?

**LT 1.B** – *I can use the margin of error to create and explain confidence intervals.*

**LT 8.B** – *I can construct and interpret a confidence interval for a population mean or a population proportion.*

- 23.** A sample of 40 randomly selected women is obtained and the blood platelet count of each subject is measured. The mean of the sample is 279.5 and the standard deviation is 65.2. **Construct and interpret** a 95% confidence interval for the population mean.



**LT 6.C** – *I can describe statistical significance.*

**LT 9.B** – *I can use a z-score and P-value to make a decision for a hypothesis test.*

**27.** A random sample of 40 new baseballs is obtained. Each ball is dropped onto a concrete surface, and the bounce heights have a mean of 92.67 inches with a standard deviation of 1.79 inches. Test the claim that the new baseballs have a mean bounce height that is less than the mean bounce height of 92.84 inches found for older baseballs. Calculate a P-value to make a decision about the null hypothesis and write a conclusion in terms of the alternative hypothesis.

$$H_0: \mu = 92.84$$

$$H_a: \mu < 92.84$$

**LT 9.C** – *I can describe type I and type II errors in context.*

**28.** Using the situation and hypotheses from Problem #27, describe a Type I and a Type II error.

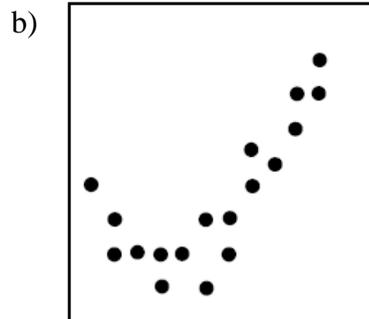
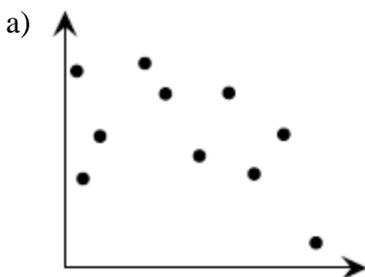
**LT 9.D** – I can carry out the entire four-step process for a hypothesis test.

**29.** A company has developed a new AAA battery that is supposed to last longer than its regular AAA battery. Based on years of experience, the company knows that its regular AAA batteries last for 30 hours of continuous use on average with a standard deviation of 2 hours. The company selects a random sample of 50 new batteries and uses them continuously until they are completely drained. The batteries in this sample last an average of 30.48 hours. Is there evidence that the new batteries last longer than the regular batteries?

Conduct an appropriate hypothesis test and discuss your results. Describe your results using both a  $z$ -score and a  $P$ -value.

**LT 7.A** – I can interpret the strength and direction of a scatterplot and estimate the correlation coefficient,  $r$ .

**30.** Briefly describe the strength and direction of the relationship and estimate the correlation coefficient.

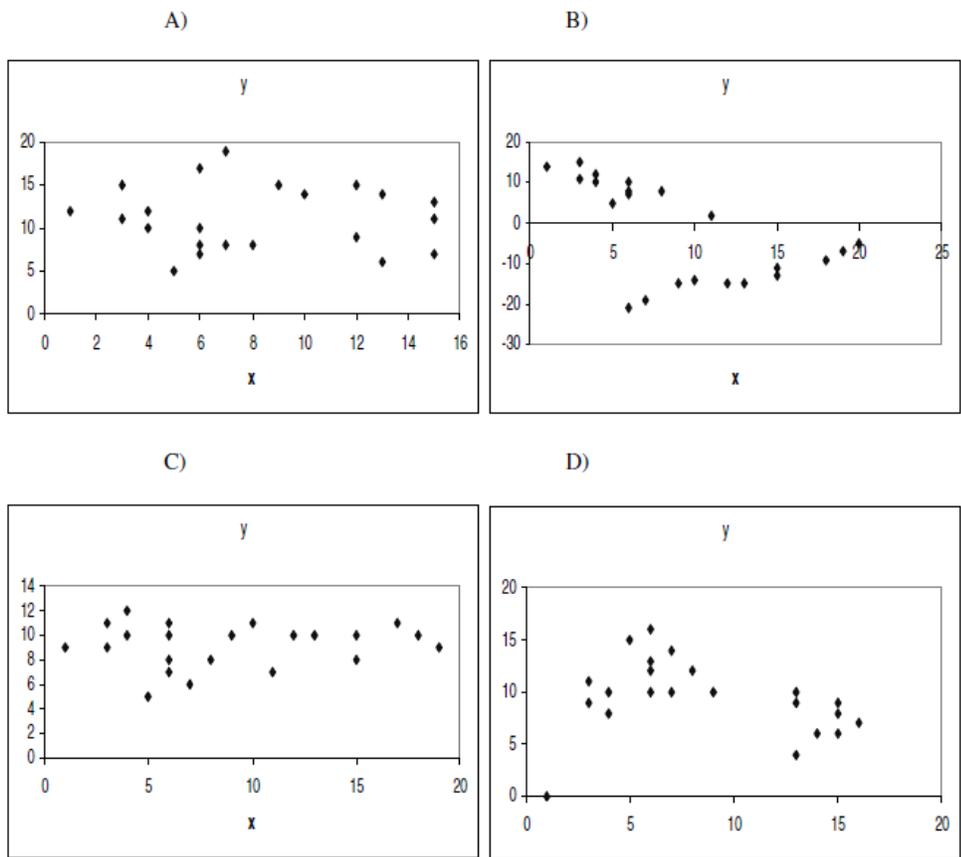


$r \approx$

$r \approx$

**LT 7.B** – I can explain cautions when dealing with correlation.

31. Which of these graphs illustrates a set of data that consists of two groups of data that are each correlated (one positive and one negative), but overall has correlation near zero? Circle the small groups of data with correlation.



**LT 7.C** – I can calculate and use an LSRL to make predictions.

32. Use the data below

<b>Height (in)</b>	76	70	68	69	70	65	66	67	71	74
<b>Weight (lb)</b>	160	185	170	175	200	160	160	175	205	215

- Calculate the LSRL of weight (y) on height (x), then use it to predict the weight of someone who is 73 inches.
- Determine and interpret the value of  $r^2$ .